

NASA Global Hawk

Aircraft Status, Integration, Op's, Schedule

8May'12



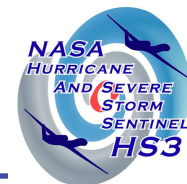
Hurricane and Severe Storm Sentinel (HS3)
Science Campaign 2012





1st 18-months of GH Science Flights:

21 Instruments, 5 Science Missions, 416 Flt-Hrs, 133,000 NM



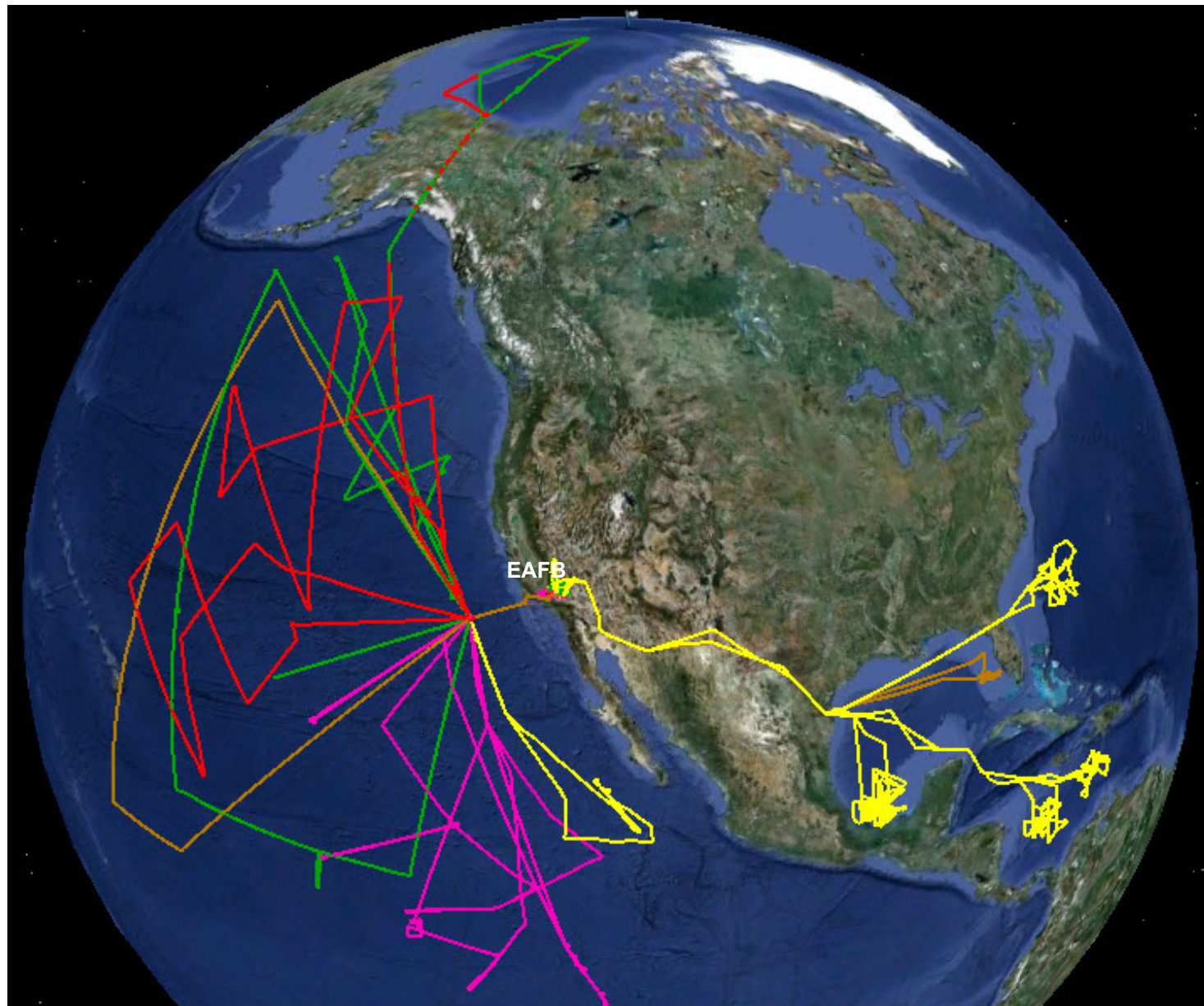
**Global Hawk
Pacific
(GloPac)
April 2010**

**Genesis and Rapid
Intensification
Processes
(GRIP)
Aug-Sept 2010**

**Winter Storms and
Pacific Atmos.
Rivers
(WISPAR)
Jan-March 2011**

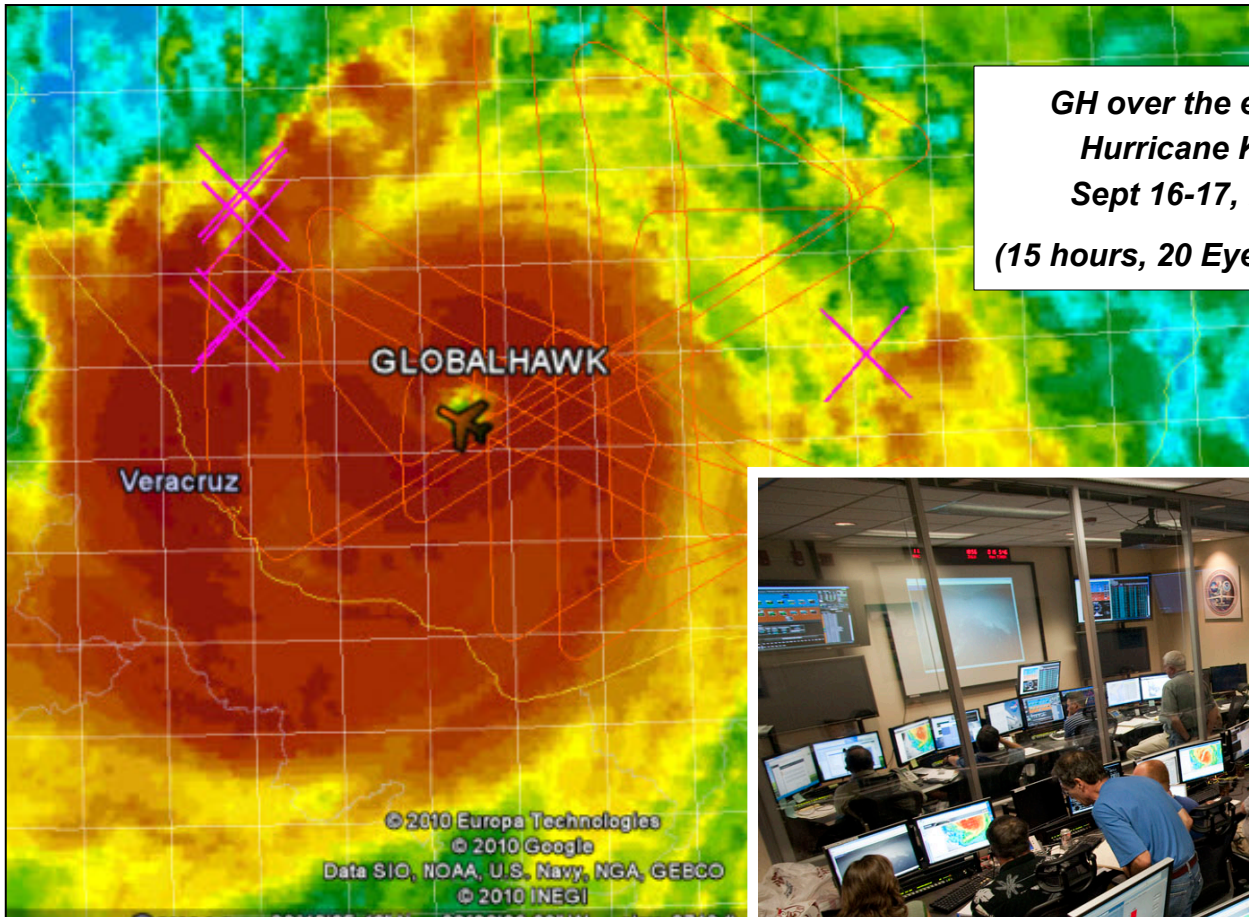
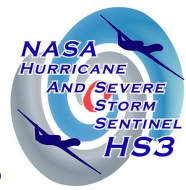
**Hurricane and
Severe Storm
Sentinel
(HS3)
Sept 2011**

**Atmos. Tropic
Tropopause Exp.
(ATTREX)
Nov 2011**





GH GRIP Experience

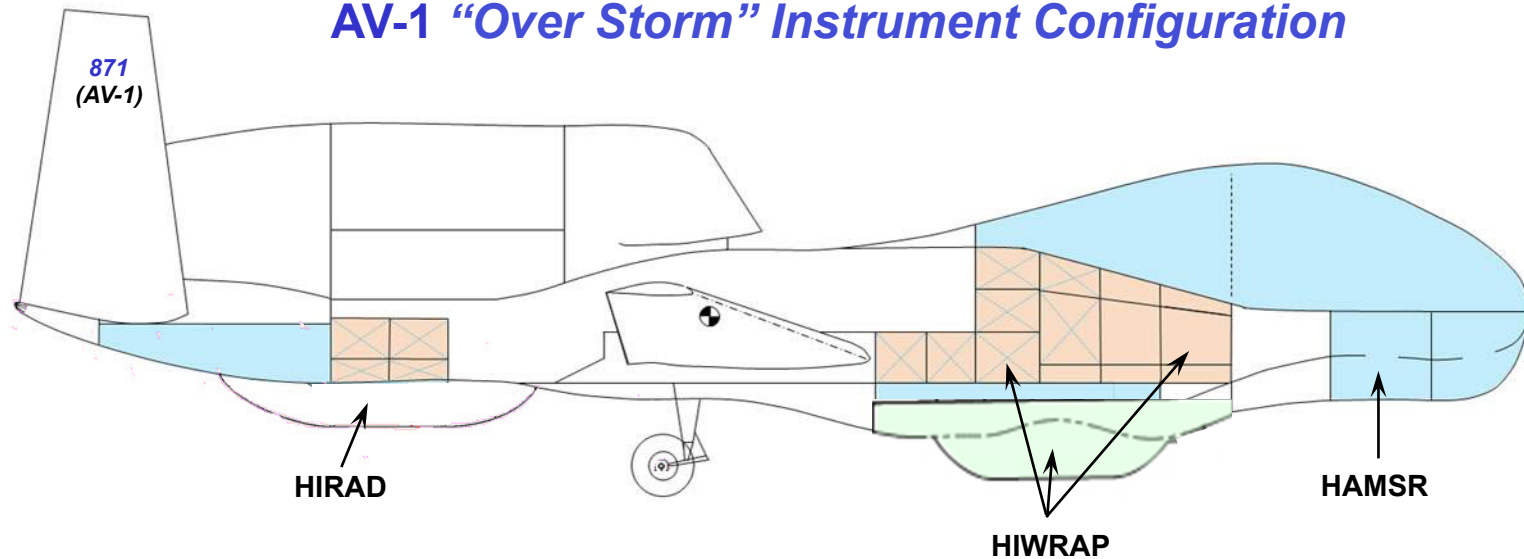


*GH over the eye of
Hurricane Karl
Sept 16-17, 2010
(15 hours, 20 Eye Passes)*



HS3 Payload on AV-1

AV-1 "Over Storm" Instrument Configuration



HAMSR



Flown on GH:

- GRIP '10,
- WISPAR '11,
- HS3 '11

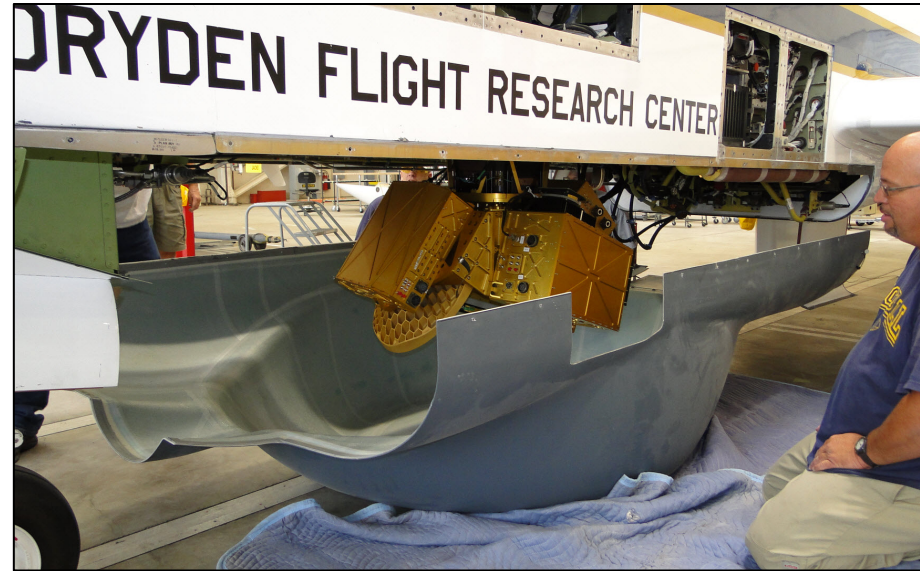
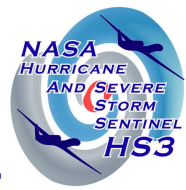
Comments / Questions:

- None





HIWRAP



*Mechanical Attachment is
identical from AV-6 to AV-1*

New Deep Fairing for AV-1

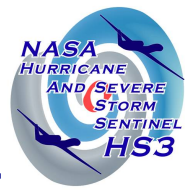
Flown on GH: GRIP '10

Comments / Questions:

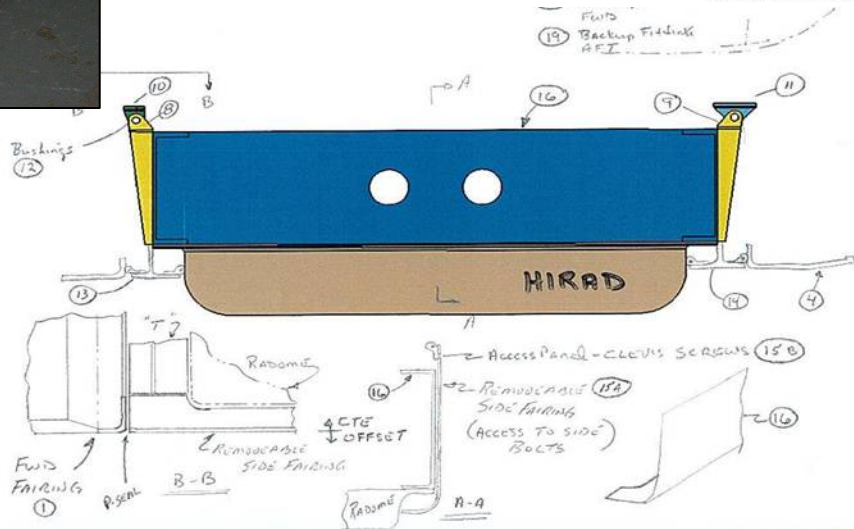
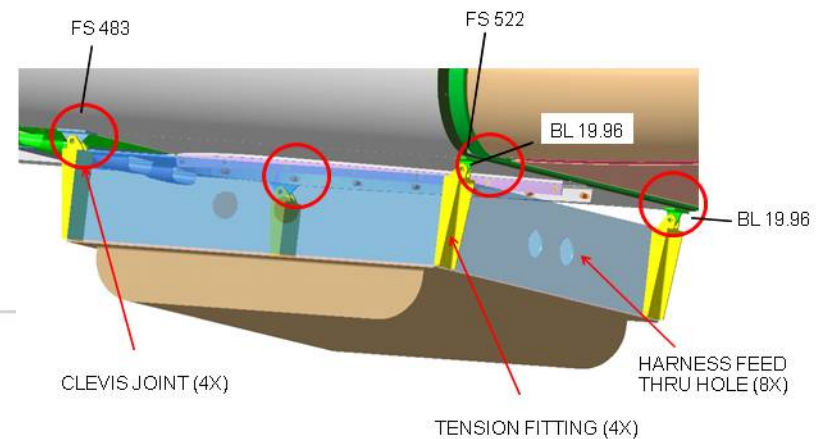
Battery Backup System?

*- In Work: Enviro Testing
@ DFRC*





*Status: NGC Design/Analysis Complete,
Fabrication at DFRC ongoing*

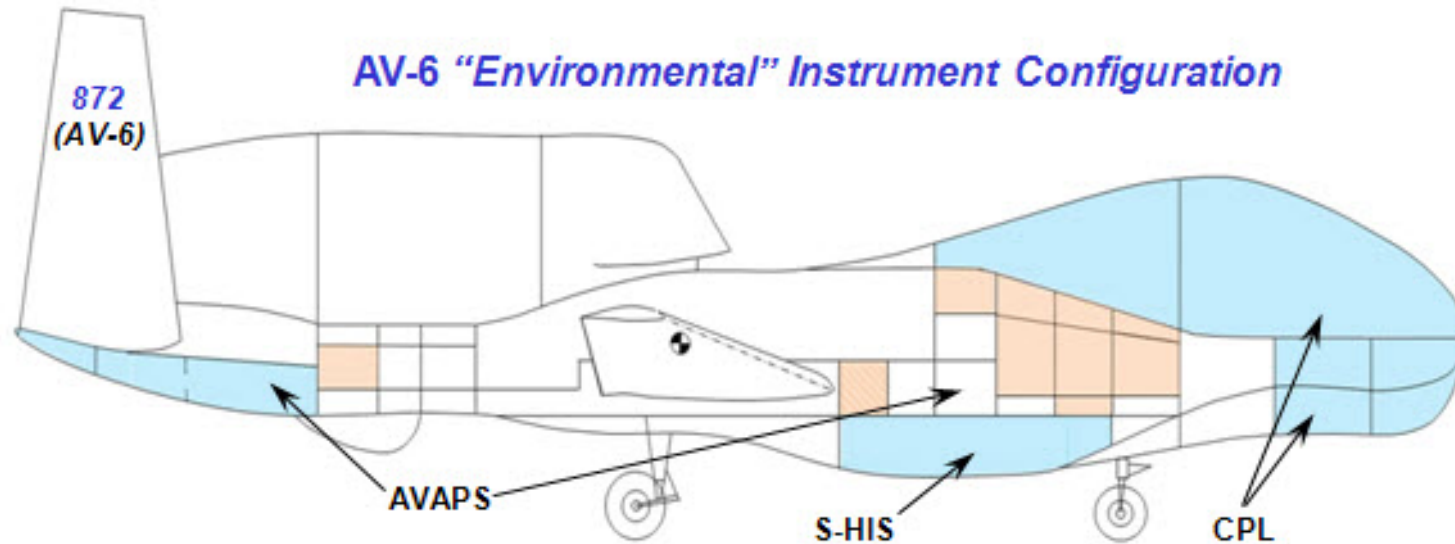


Black Body for Cal?

- Yes

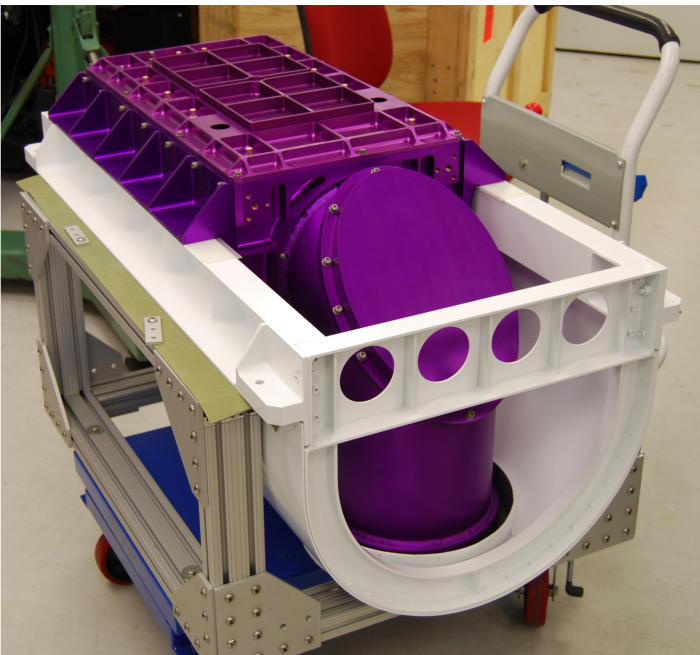
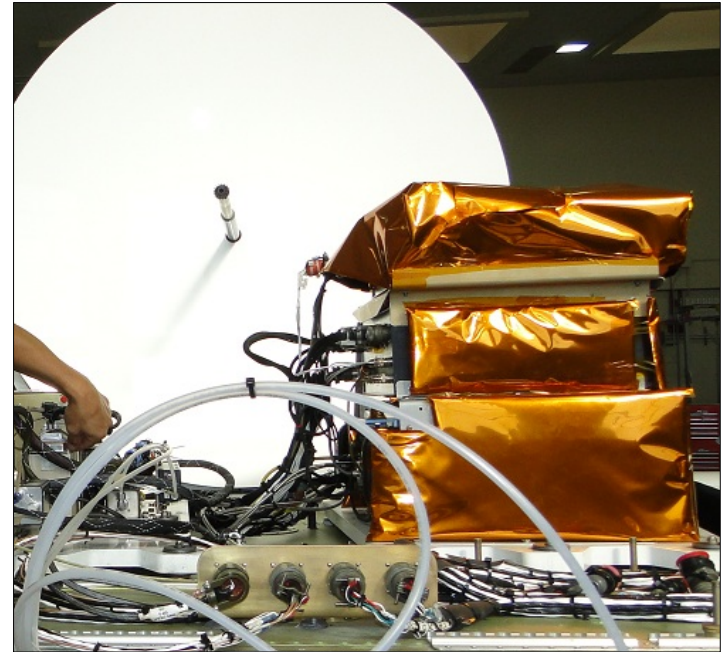
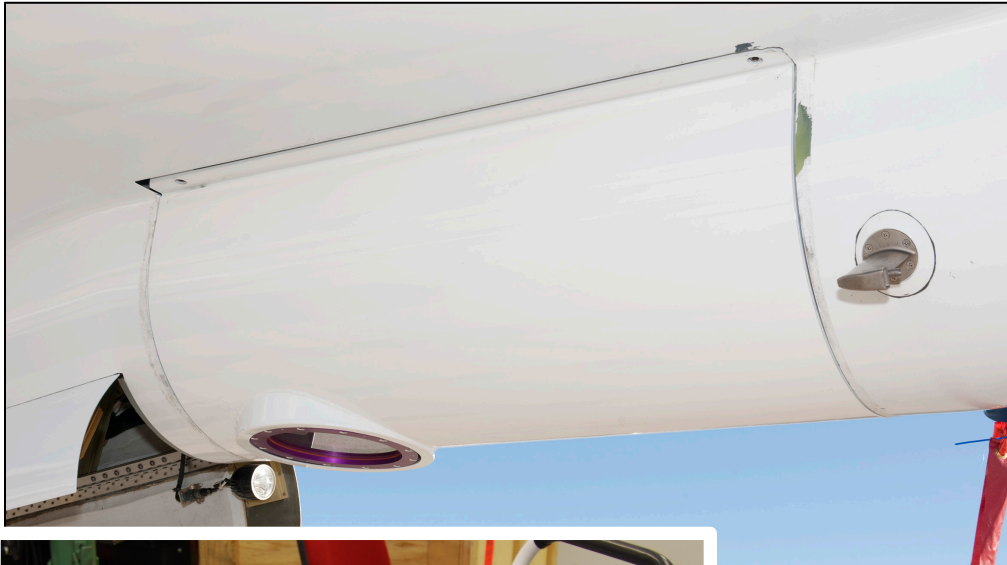
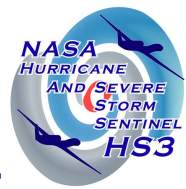


HS3 Payload on AV-6





CPL

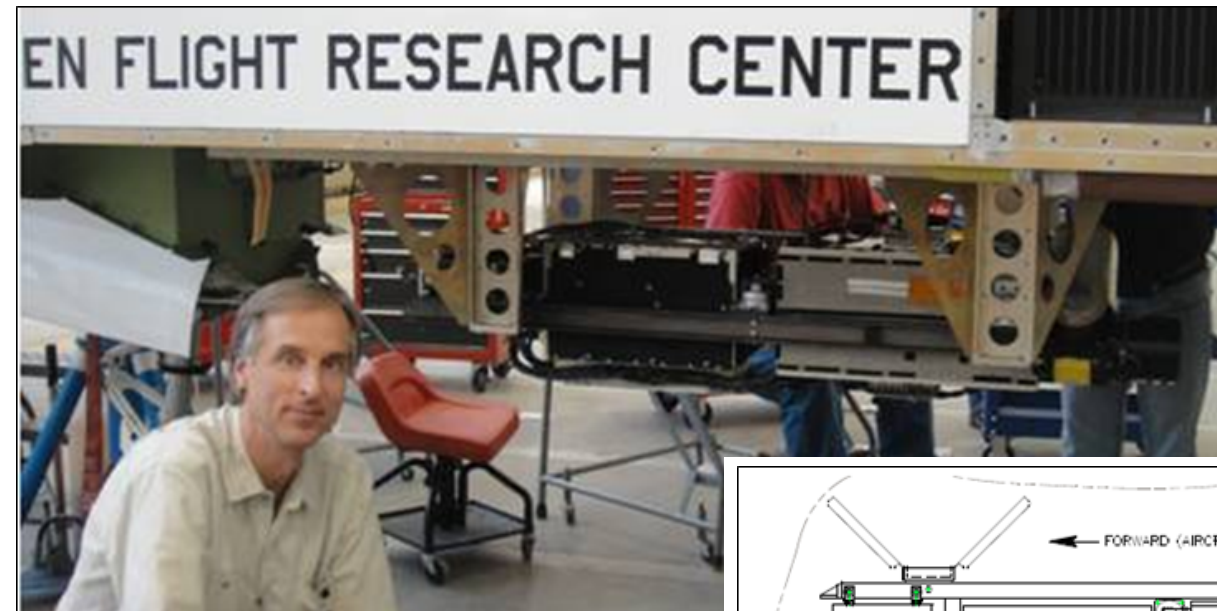


*Instrument mounted in Zone-3
Avionics Pallet mounted in Zone-7
Flown on GH: GloPac '10, HS3 '11*

Comments / Questions:

Turn-on Allowance in COA?

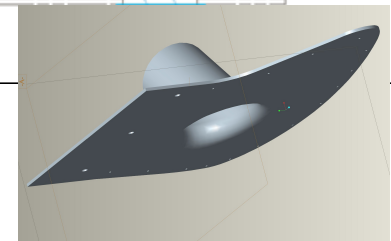
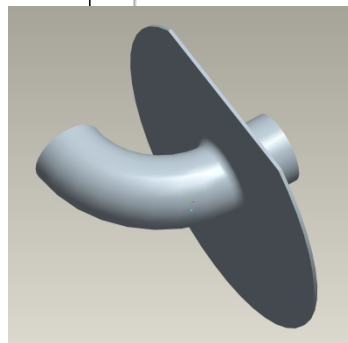
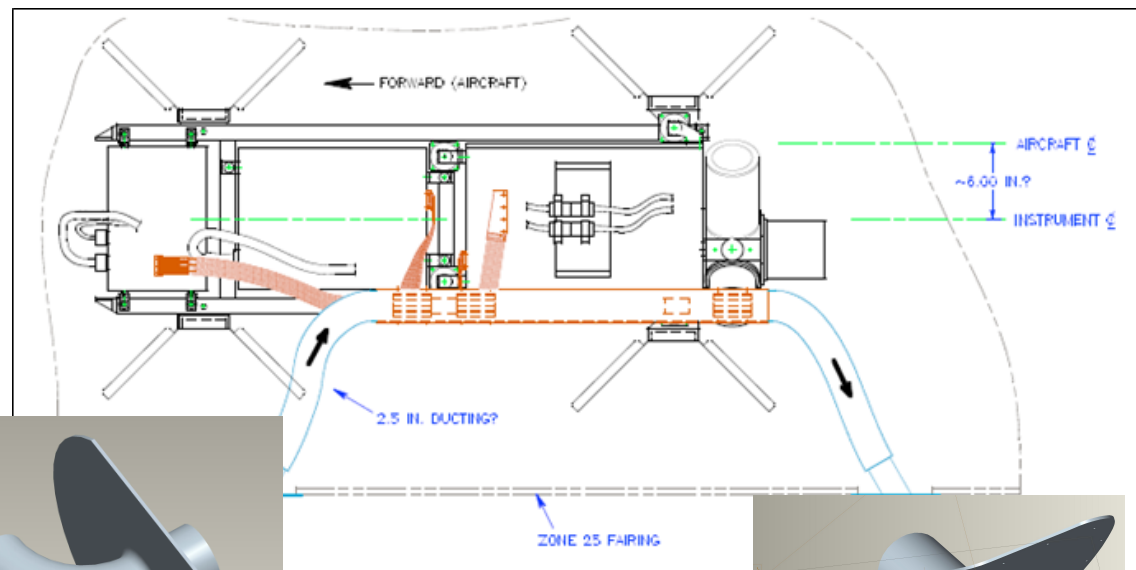
*- FL520, Over Water,
VACAPES Laser Approval*



*Flown on GH:
HS3 '11*

Comments / Questions:

- *Cooling Duct Progress?*
 - *In Design, NGC has provided Inlet/Exhaust design feedback*

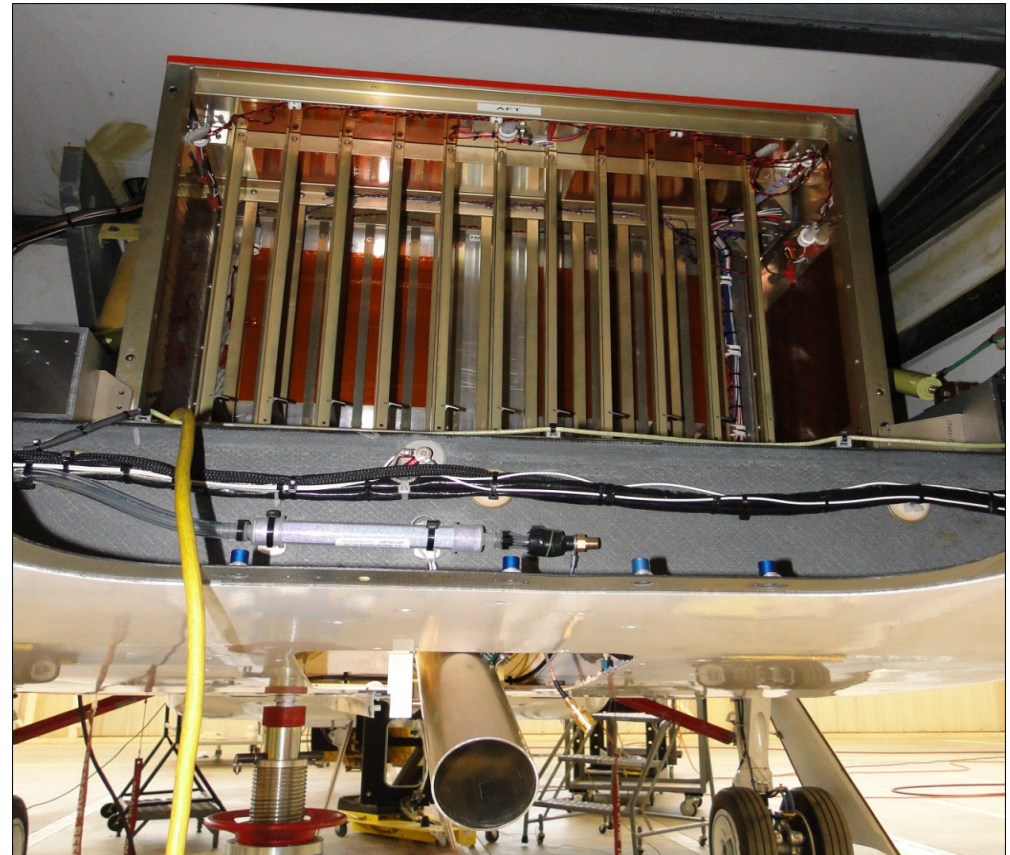


“WISPAR” Flight Summary

- 69.6 Flt. Hours
- 190 sondes deployed

Flown on GH:

WISPAR ‘11, HS3 ‘11

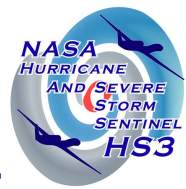


Comments / Questions:

- *None*



GH Flight and Payload Op's



MOF's Near Building N-159



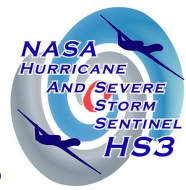


GHMOF (Flight Op's) Trailer

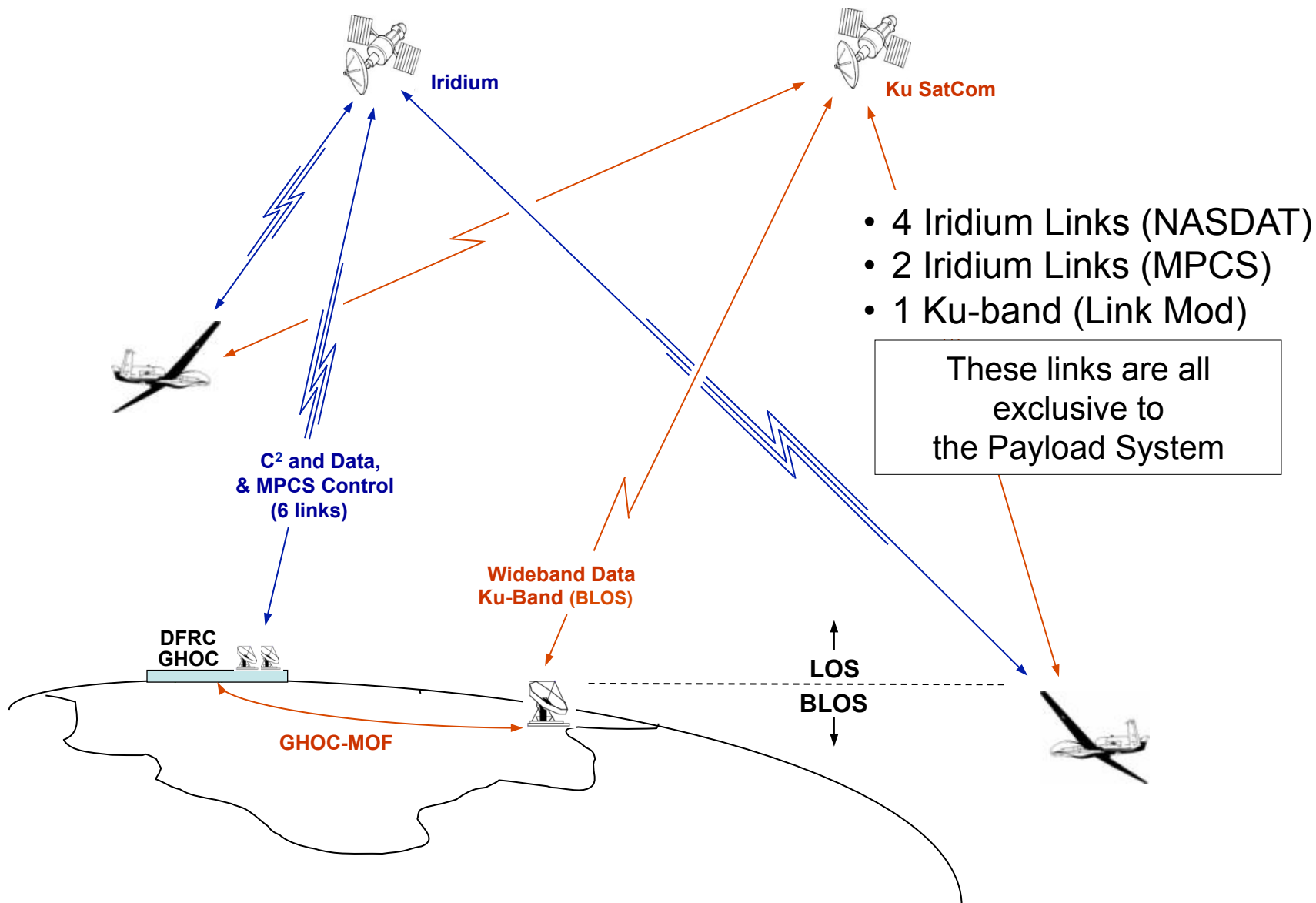




PMOF (Payload Op's) Trailer



Payload C3 Satcom Links

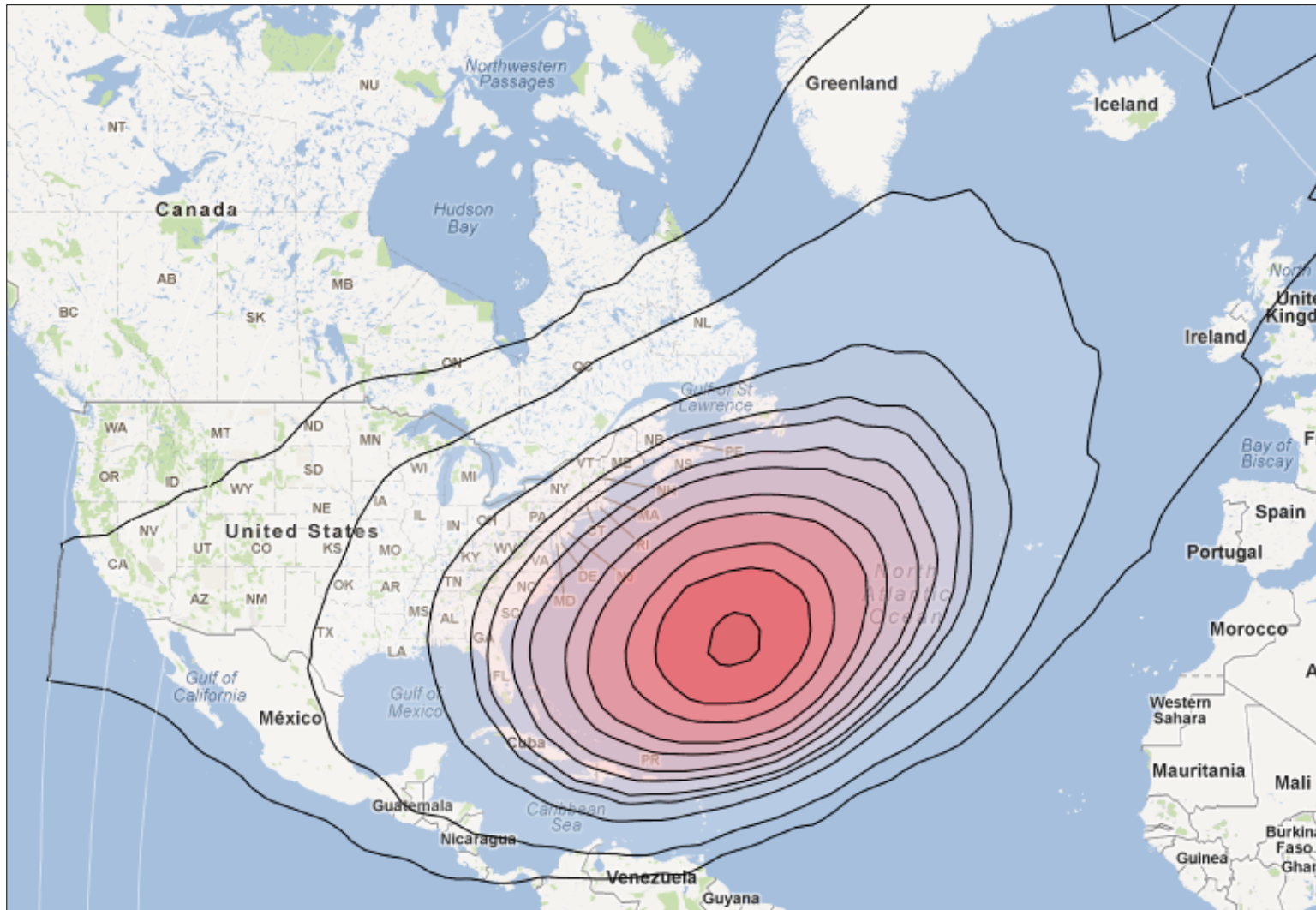
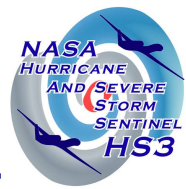




Amazonas-2 Satellite Ku N.America Beam Coverage



Payload C3 – Ku Coverage



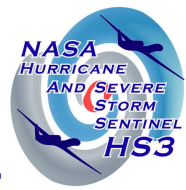
Intelsat 703 Satellite
Ku Spot-2 Coverage

Hangar Operations





Integration, Testing, Safety





AV-6 Prep for HS3



AV-6 Tasks for HS3

V10.5, Updated 30Apr12 - DFRatello

Task	Complexity	Criticality	Engineering	Procurement	W.O. & Fabrication	Assembly	Bench Testing	Enviro. Tests	Kit Ready	Installation / Test	Comments
Aircraft											
KU Audio Equipment	3	Required	Complete	Complete	Complete	Complete	In Work, Ongoing Troubleshooting	In Work, Enviro testing this week	Complete	On Hold - Mount Install pending Enviro completion	Rockwell Collins is assisting with trouble shooting.
New Ku Bus Converter	2	Required	Complete	N/R	Complete	Complete	N/R	N/R	Complete	Complete	Complete
Upgrade Aircraft Batteries	3	Required	Complete	Complete	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Maintenance Free Batteries
New Payload Iridium Filters	2	Required	Complete	Complete	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Improved performance
Paint AESA Radome Glossy White	1	Required	N/R	N/R	In Work	N/R	N/R	N/R	N/R	N/R	Using EAFB paint shop
C2 Iridium Antenna Relocation	3	Preferred	Not Started	N/R	Not Started	Not Started	N/R	N/R	Not Started	Not started	Possible improvement of Iridium performance
Science Capability											
HDFis Heater Installation	1	Required	N/R	Complete	N/R	N/R	On Hold - pending wiring mod	N/R	N/R	On Hold - Aircraft	Should negate ice crystals that have formed on past missions.
Low-light Nose Camera Upgrade	1	Required	On Hold	In Work	On Hold	N/R	N/R	On Hold	In Work	On Hold - Aircraft	Pending decision on pressure-box requirements and camera parts
APCS - B/U Battery Enable Discrete	2	Required	On Hold, pending MPCs pin-out	Complete	Complete	In Work	N/R	N/R	In Work	On Hold - Aircraft	New INS Backup Battery capability for Instruments (Req. by HIWRAP)
TCAS-1 Installation	4	Preferred	On Hold	Complete	Not Started	Not Started	Not Started	Not Started	Not Started	Not started	On hold, pending FAA discussions
HS3 Instruments											
CPL	1	Required	Complete	Complete	Complete	Complete	Complete	Complete	Complete	On Hold - Aircraft	Flight Ready
S-HIS	1	Required	Complete	Complete	Complete	Complete	Complete	Complete	Complete	On Hold - Aircraft	Flight Ready
- Mod SAR Fairing for Inlets/Outlets	2	Required	Complete	N/R	In Work	N/R	N/R	N/R	N/R	On Hold - Aircraft	Instrument Cooling Mod at PI's request after flight tests
- New Standoffs and Cooling Duct	2	Required	In Work	N/R	In Work	On Hold - pending fab	N/R	N/R	In Work	On Hold - Aircraft	Instrument Cooling Mod at PI's request after flight tests
AVAPS	1	Required	Complete	Complete	Complete	Complete	Complete	Complete	Complete	On Hold - Aircraft	Flight Ready

Complexity: Scale of 1-5
5= Most Difficult

Legend	
Complete	Complete
In Work	In Work
On hold	On hold
Not Started	Not Started
Not Required	Not Required



AV-1 Prep for HS3



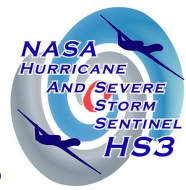
AV-1 Tasks for HS3

V10.5, Updated 30Apr12 - DFRatello

Task	Complexity	Criticality	Engineering	Procurement	W.O. / Fabrication	Assembly	Bench Testing	Enviro. Tests	Kit Status	Installation / Test	Comments
Aircraft											
ELT	1	Required	Complete	In Work	In Work	On Hold - parts	N/R	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 Installation
Underwater Acoustic Beacon	1	Required	Complete	In Work	In Work	On Hold - parts	N/R	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 Installation
ATC Antenna Mod	2	Required	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Completed
KU Audio Equipment	3	Required	Complete	In Work	In Work	In Work	In Work - System Troubleshooting	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 Installation
Upgrade Aircraft Batteries	2	Required	Complete	Complete	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 Installation
Bleed Air Mod/Heat Loads	5	Required	In Work	In Work	In Work	On Hold - Aircraft Avail.	N/R	N/R	In Work	On Hold - Aircraft	Will lengthen time AV-1 can fly at high altitudes; parts from AV-7.
Science Capability											
Complete APCS (Kit 2) Integration	2	Required	Complete	N/R	In Work	In Work	N/R	N/R	In Work	On Hold - Aircraft	Wiring & substructure 90% compl.
NASDAT/ MPCs/ LM for AV-1	2	Required	N/R	N/R	Complete	In Work	On Hold - Equip. Readiness	Complete	N/R	N/R	Provided by Ames
EIPs for AV-1	2	Required	N/R	N/R	Complete	In Work	On Hold - Equip. Readiness	Complete	N/R	N/R	Parts provided by Ames, assembly by DFRC Electronic Shop.
KU System Installation	4	Required	Complete	N/R	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 System
Low-light Nose Camera Installation	2	Required	In Work	In Work	On Hold - Decision on using AV-6's Design	On Hold - parts	On Hold - Camera arrival	Complete	In Work	On Hold - Aircraft	85% Duplicate of AV-6 System
GHIS Accelerometer Package	1	Required	Complete	N/R	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Duplicate of AV-6 Installation
Stormscope	2	Required	In Work	Complete	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	95% Duplicate of AV-6 Installation
New Payload Iridium Filters	2	Required	Complete	Complete	In Work	In Work	N/R	Complete	In Work	On Hold - Aircraft	Improved performance
HDVis Camera replacement for use with HIRAD installation	2	Required	N/R	In Work	N/R	On Hold - Camera	On Hold - Camera	On Hold - Camera	In Work	On Hold - Camera and Aircraft	New Camera on Order
APCS - B/U Battery Enable Discrete	2	Required	On Hold, pending MPCs pin-out	Complete	In Work	In Work	N/R	N/R	In Work	On Hold - Aircraft	New INS Backup Battery capability for Instruments (Req. by HIWRAP for HS3)
TCAS-1 Installation	3	Preferred	On Hold	Complete	Not Started	Not Started	Not Started	Not Started	Not Started	Not started	Pending FAA COA discussions
DMS Camera	3	Preferred	Not Started	Complete	Not Started	Not Started	Not Started	Not Started	Not Started	Not started	Progress pending Project Decision
HS3 Instruments											
HAMSRR	1	Required	Complete	Complete	Complete	Complete	Complete	Complete	Complete	On Hold - Aircraft	Flight Ready
HIWRAP	2	Required	In Work	In Work	In Work	On Hold - Aircraft Avail.	N/R	N/R	In Work	On Hold - Aircraft	New wiring runs and Z-16 Instrument Installation - All are duplicates of prior AV-6 Install'n
- AESA Deep Fairing Fabrication	4	Required	Complete	In Work	N/R	N/R	N/R	N/R	N/R	On Hold - Aircraft	New installation for AV-1
HIRAD	5	Required	Complete	In Work	In Work	In Work	On Hold - HIRAD needed @ DFRC	N/R	In Work	On Hold - Aircraft	New Instrument Installation in a new Payload Mount area (under rear fuse - outside OML)

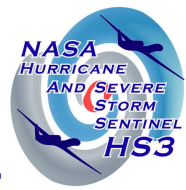


Ongoing KQX Effort Ends July 1st





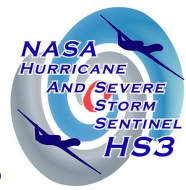
HS3 2012 Payload Integration



- **Preflight Instrument Testing at DFRC**
 - *Data Comm's Checkout*
 - *Be sure to Contact Caitlin Barnes, Don Sullivan with Changes*
 - *HIRAD needs to continue to coordinate data file review, software prep*
 - *Integration and Instrument Testing on aircraft*
 - *Outdoor SatCom Testing with PI's in PMOF (Pre-CST)*
 - *Formal Combined System Test (CST)*
 - *Functional Tests during Range Flight w/Cold Soak*
- **AV-1 is New to Airborne Science**
 - *New AESA (Deep) Radome*
 - *New Payload Mount Installation (used by HIRAD)*
- **All Payload Op's shall take place from PMOF at WFF**



Pre-Mission DFRC Operations



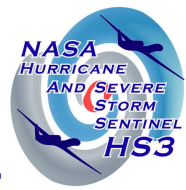
**“Pre-CST”:
Payload System Satcom, PMOF
Op., and Instrument C3 Test**

**“CST”:
Formal Aircraft EMI
Test, Preflight Op.
with Engine Run**





Payload Hazard Review



CPL Lidar, Zone-3

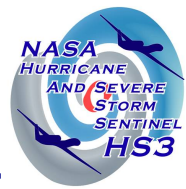
HIWRAP Radar, Zone-25





HS3

Instrument SSWG Hazard Review

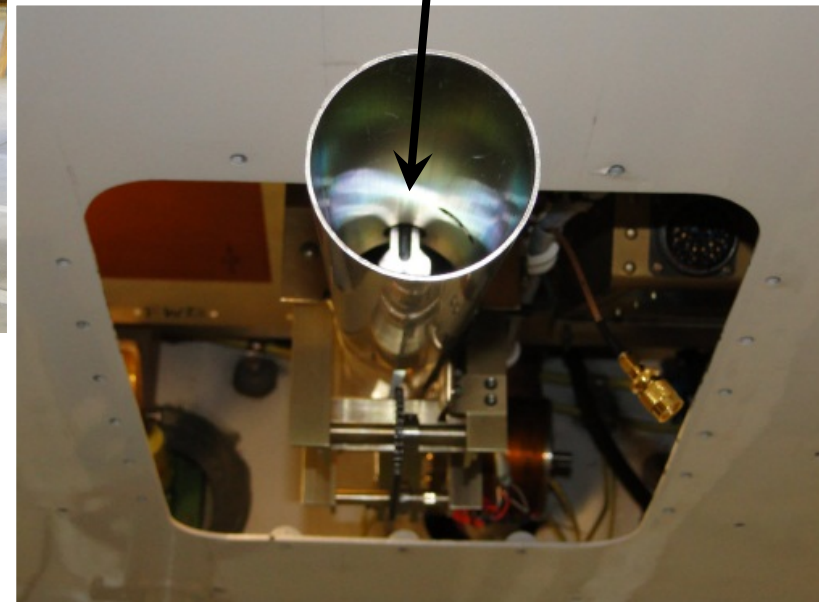


- **Each Payload's Mechanical & Electrical Interfaces are Covered by Existing Hazards.**
 - Example: Electrical/Heaters/pumps/micro-motors/UPS batteries are covered under existing HR-28 Electrical Overload or Failure.
- **CPL is an Active Emitter:**
 - Cloud Physics LIDAR (**CPL**) Laser Emitter, Hazard Class IV
 - MPCS Safety interlock switch to inhibit until pilot commanded
 - (3) different wavelengths (1064 nm, 532 nm, 355 nm)
 - Propagates nadir only from Zone 3 Nose Radome
 - Human Nominal Ocular Hazard Distance (NOHD) (1064 nm @ 3,465ft, 532 nm @ 8,963ft & 355 nm @ 0ft)
 - Previously flown *GLOPAC-'10, HS3-'11*
- **AVAPS will be Ejecting Dropsondes:**
 - Aft Lower Fuselage Dispensing Location of Sondes in Flight (Zone 61)
 - New Smaller Sonde weight & size, ~185 grams
 - Use of Experienced Sonde Team from NCAR
 - MPCS Safety-interlock of Safety Latch for Release Control
 - Sonde Mission Plans over Un-occupied Areas
 - Revalidated Sonde departure with SAR Radome Zone 25

AVAPS Safety Mitigation

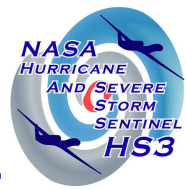


AVAPS Safety Latch
Controlled by GH
Mission Director





Flight Operations Summary



Mission Planning:

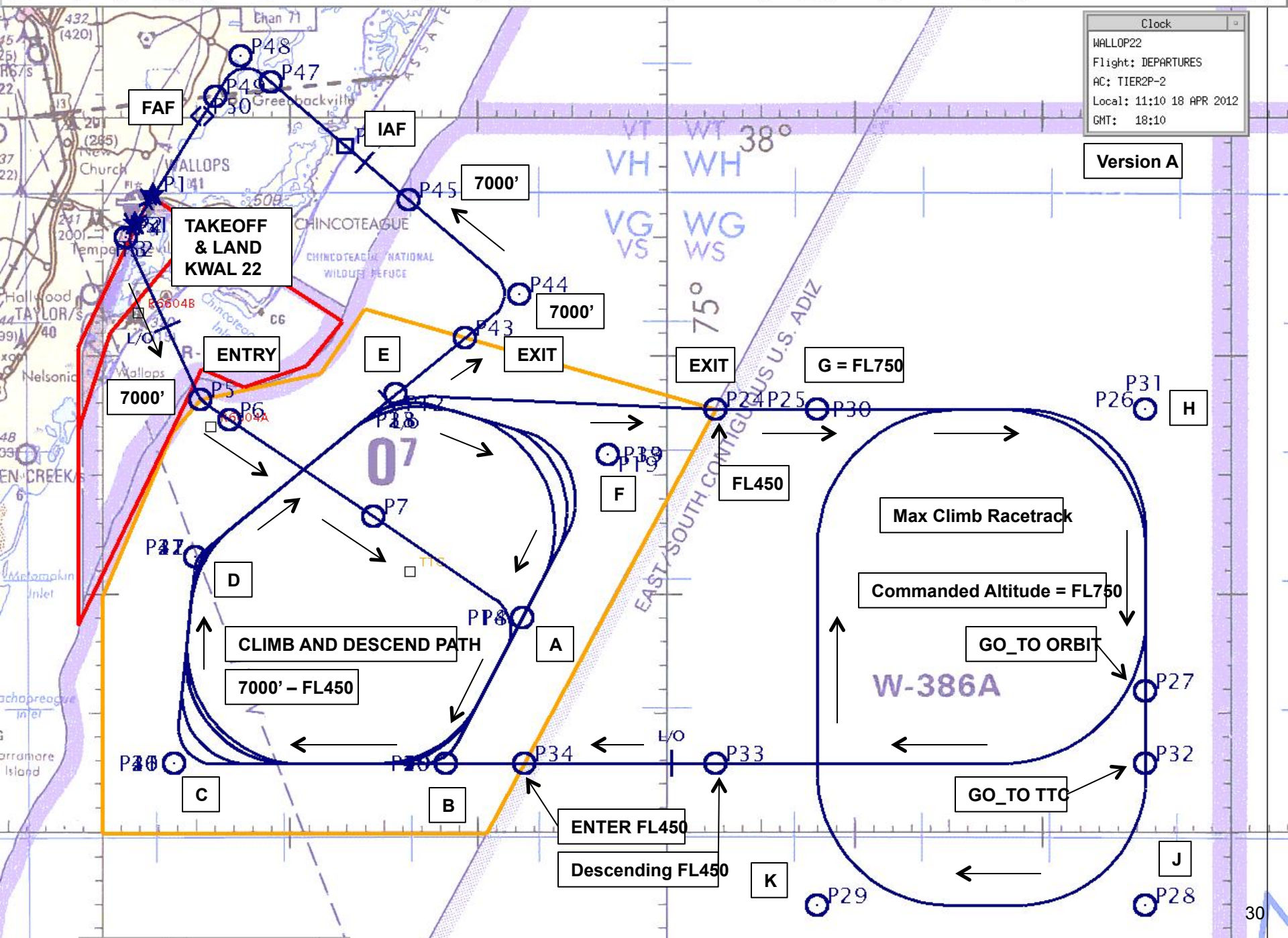
- NGC Developing Mission Plan
- Wallops approaches and departures shown here are notional
- FASFAC VACAPES is developing Test Track C subarea for NASA Global Hawk in W-386

Departures:

- Conditions: Day, VMC+ only
- Operating control tower and visual observer required for all departures
- Chase required to be on standby during departure in case of RTB (2-3 hrs?)
- R6604 required exclusive used surface to 10,000 MSL
- Test Track C required exclusive use 5,000 MSL to FL450

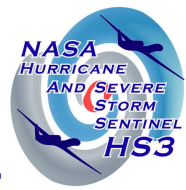
Approaches:

- Conditions: Day, VMC+ only
- Operating control tower and chase aircraft required for all approaches & runways
- Chase aircraft will join GH in W-386
- Non-emergency RTB will not be approved for night (required to loiter until daylight)





Flight Operations Summary (Continued)

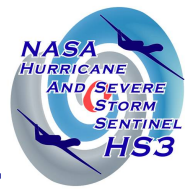


Emergencies:

- If an emergency RTB back to WFF is declared by the PIC, ATC will provide emergency handling to reduce loss of life and property. PIC will follow emergency procedures checklist. (Non-emergency RTB's will loiter in Atlantic until after dawn.)
- If required, and emergency landing could occur at night and/or during IMC conditions.
- Control tower is required for emergency RTB (activate Class D airspace)
- Other Emergency landing fields: Pax River, KSC, Cherry Point MAS, MAS Station Beaufort, Mayport, Caribbean site (possibly Puerto Rico)
- DFRC pilots will conduct an emergency landing at WFF in the event that WFF pilots are in crew rest.
- The FAA definition of an emergency is a distress or an urgency condition. Detailed contingency procedures will be provided to FAA.



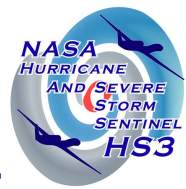
Flight Operation – Timeline



- T-2 Day
 - Flight route determined by science
 - Mission Route transmitted to FAA by COB
- T-1 Day
 - NOTAM for CPL and Dropsondes transmitted
 - Aviation weather briefing
 - 'T-1' Crew Briefing
 - Aircraft and GHMOF preflights
- T-3 hrs
 - Aviation weather briefing
 - File DD1801 flight plan
 - Aircraft / GHMOF preparation
- T-2 hrs
 - 'T-0' Crew Briefing
 - 1st Shift Personnel man "MOF's"
- T-1 hr - Engine start



HS3 2012 Mission Milestones



N872NA (AV-6) Environmental GH

- -- -- AV-6 Instrument Team's Arrive at DFRC
- **8/22/2012** **CST**
- 8/24/2012 DFRC range flight
- 8/29/2012 Ferry flight to WFF
- 8/30/2012 Open science flight window
- 10/5/2012 Close science flight window
- 10/6/2012 Ferry flight to DFRC

N871NA (AV-1) Over Storm GH

- -- -- AV-1 Instrument Team's Arrive at DFRC
- **8/31/2012** **CST**
- 9/5/2012 DFRC range flight
- 9/7/2012 Ferry flight to WFF
- 9/8/2012 Open science flight window
- 10/5/2012 Close science flight window
- 10/8/2012 Ferry flight to DFRC